

Emerging Diseases in Southern Sea Otters

The southern sea otter is a large mustelid that spends its life in the nearshore marine community along the California coast. Prized for its fur, this subspecies was thought extirpated until a remnant population of approximately 50 animals was discovered near Big Sur in the early 1900's. The slowly recovering population was listed as threatened by the U.S. Fish and Wildlife Service in 1977. Although the sea otter's range has expanded to cover more than 320 kilometers of the central California coast and the population is now about 2,500 animals, the rate of recovery has been slower than biologists expected (Riedman and Estes 1990; Riedman et al. 1994). Concern that excess mortality was hindering recovery prompted the U.S. Fish and Wildlife Service to ask the U.S. Geological Survey's National Wildlife Health Center to perform an intensive necropsy survey of wild southern sea otters beginning in 1992.

The necropsies we performed from 1992 through 1995 yielded unexpected results (Figure). In particular, we found that the frequency and variety of infectious diseases were unusual for wildlife species. Forty percent of the sea otters examined died from parasitic, fungal, or bacterial infections. Traumatic injuries are generally common in wildlife, and injuries such as shark attack or shooting were also common (21%) in southern sea otters. Eleven percent of the otters were emaciated at death with no specific cause identified for this debility. In 10% of the sea otters, we diagnosed a variety of other problems, such as gastrointestinal or urinary tract obstructions or tumors. For 18%, we could not ascertain the cause of death.

Peritonitis induced by acanthocephalan parasites was the most frequent (15%) cause of death by infectious disease we identified in the otters. Peritonitis occurs when acanthocephalan parasites that inhabit the intestine migrate aberrantly through the intestinal

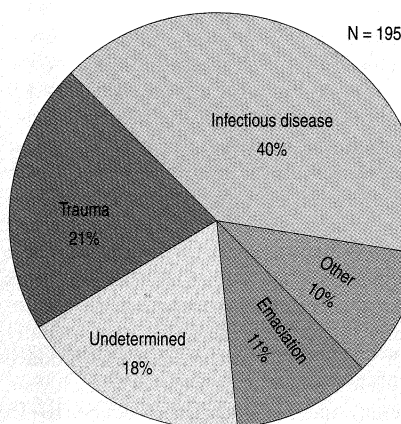


Figure. Causes of mortality in southern sea otters from 1992 through 1995.

wall, perforate the intestine, and allow bacteria to enter the abdominal cavity. Although this parasite (*Polymorphus* sp.) has been present in the sea otter population for many years (Hennessy and Morejohn 1977), the infection and mortality rates observed in the 1990's appear unprecedented. The invertebrate intermediate hosts that transmit this parasite are largely unconfirmed, and the roles of other hosts, such as birds, are unexplained.

Another parasitic disease, protozoan encephalitis, was newly identified in this survey, indicating that it may be an emerging disease. We are investigating the identity of the causative parasite; the ubiquitous organism *Toxoplasma gondii* was isolated from several otters, but the results are confounded by evidence that another protozoan may also be involved. Fatal toxoplasmosis is more common in animals and humans that have impaired or immature immune systems than it is in healthy organisms.

Before our study, coccidioidomycosis, or San Joaquin Valley fever, had been described in a sea otter only once, in 1976

(Cornell et al. 1979), but one or more cases were diagnosed during each year of our survey (Thomas et al. 1996). This fungal disease affects humans and animals in the deserts of the lower Sonoran life zone of the southwestern United States, so its prevalence in the marine environment is puzzling. The fungus *Coccidioides immitis* thrives in arid and semiarid soil. Inhalation of the airborne fungal spores may produce respiratory disease, or the spores may disseminate to many organs in susceptible individuals. The cases of San Joaquin Valley Fever in sea otters coincide with a human epidemic of the fever that began in California in the fall of 1991. The human epidemic was tentatively attributed to unusual weather and environmental conditions rather than to human-related factors, a hypothesis supported by the coincident occurrence in sea otters.

Researchers continue to monitor southern sea otter abundance and distribution to assess the population's progress toward recovery goals. The emergence of several diseases as important causes of death raises concern about the otters' immune status and resistance. By elucidating factors in the individual disease cycles we are trying to determine both an explanation for the emergence of these diseases and a means of controlling them. The challenge remains to identify not only the overt but also the underlying factors that may have more far-reaching effects in the marine environment.

See end of chapter for references

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Beaches and dunes, which are separate but usually connected sandy coastal habitats (Barbour and Johnson 1977), are limited to 305 kilometers of California's coastline, whereas the more limited occurrence of major dunes along the California coast is described by Cooper (1967), who does not include many smaller dunes in his discussion. The Antioch Dunes National Wildlife Refuge is a unique dune system found along the tidal Sacramento-San Joaquin River (Cooper 1967).

Beaches, as defined by Barbour and Johnson (1977), are limited to the salt spray-saturated zone below the highest high-tide line, typically seaward of the foredune crest. Beaches have a very limited flora of salt-tolerant plants that includes European beachgrass, maritime sea-rocket, silverweed cinquefoil, coastal sand verbena, and iceplant as dominants, and pink sand verbena and beach saltbush as subdominants (Barbour and Johnson 1977).